



Monthly Report

(Period Ending 31 May 1999)

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Current Items:

Restart of Joint Project on Severe Accident Management - Activity on the Joint Project between USINSC and RINSC on Severe Accident Management was terminated in January because the NIKIET Sanctions prohibited any contact with the RINSC Principal Investigator, Yuri Nikitin, a NIKIET employee. RINSC has selected a new Principal Investigator, Nikolai Fil of OKB-GP, and the Work Order for the Joint Project has been rewritten to include only activities on VVERs. Bruce Spencer (ANL) met in Moscow on 10 May 1999 with Alex Kraev and Leonid Kabanov of RINSC and Nikolai Fil (OKB-GP) to discuss the rewritten Work Order. The Work Order now contains plans for completing the modeling of VVER features in MELCOR and plans for one or two MELCOR analysts from RINSC to be at ANL during the Summer of 1999 to complete preparation of input for MELCOR. It was agreed at this meeting that the next meeting of the Task Group for Severe Accident Management should be held during the week of 18-22 October 1999, concurrent with the Severe Accident Forum to held at Obninsk, and that the next planning meeting for the Joint Project on Severe Accident Management should be held in November 1999 at the USINSC.

Future Activities for Joint Project on Investigation of the Physical and Chemical Properties of Liquid Metals and Their Use in Power Systems - Initially, the Russian leader of this joint project was A. Filin of NIKIET; the activities were related to sodium and lead coolants and they were to be performed by people at NIKIET. With the sanctions against NIKIET, a new Russian leader and new participants have to be identified. Bruce Spencer (ANL) met with Alex Kraev and Leonid Kabanov of RINSC and Alexander Efanov, Director of the Thermophysics Department of IPPE in Moscow on 11 May 1999 to discuss this situation and propose a new Work Order to cover the new activities and the new organization of this Joint Project. It was agreed that there will meetings with prospective collaborators in Obninsk during the CSNR '99 meeting the week of 28 June 1999. Then on 2 or 5 July there will a meeting at the RINSC in Moscow for wrap-up discussions and preparation of the Protocol. The Work Order was signed by the RINSC and the signed document was carried to ANL for completion of the document execution.





Current Items: (cont'd)

<u>SAM '99 Forum</u> – Several meetings were held on 11-14 May 1999 in Moscow to make plans for the second Severe Accident Management (SAM) Forum, which will be held at IPPE in Obninsk on 18-22 October 1999, about 2 years after the first SAM Information Exchange Meeting that launched the SAM joint project in September 1997. This meeting is to be jointly sponsored by the US and RF INSCs. The main purpose of this meeting is to highlight the accomplishments of the SAM joint project, to disseminate the program information and program results to persons in Russia and the US involved in SAM-related activities, and to provide a forum for general regulator considerations, relevant R&D, and presentation of related programs worldwide. This includes presentation of preliminary SAM strategies for VVER reactors, status and early results using MELCOR-V320, update on the status of SAM in US and MBDA in Russia, related programs such as TACIS/Balakovo and MELCOR Certification, and results of severe accident experiments and analysis in Russia and the US having applicability to SAM.

Bruce Spencer (ANL), Nikolai Fil (OKB-GP) and Lev Kochetkov (IPPE) will be the technical cochairmen and Dr. Zrodnikov, director of IPPE, will be the general chairman.

A meeting was held with Boris Solovyov and Vladimir Yarovitsin, both from IPPE, to review the draft contract documents for the support that will be provided to IPPE for holding the SAM '99 meeting. Boris Solovyov is the IPPE contract manager for logistics and finances for this activity and Vladimir Yarovitsin is the IPPE Deputy Head of the Department of International Relations. Argonne has prepared a basic ordering agreement (BOA) with IPPE and a draft Work Order (WO) to contract for SAM '99. The BOA and the draft WO were acceptable with only minor wording changes and clarifications. The remaining document execution work for the BOA and the WO will be done by the ANL subcontracts office.

The agenda for the meeting will cover three main technical areas:

- Safety authority approach and requirements for accident mitigation and accident management.
- Current approach to SAM development and implementation.
- Technological basis for BDBA accident analysis and management; computer codes, analyses, experiments.





Current Items: (cont'd)

There will be twenty four one-hour papers, sixteen from Russia and eight from the US. There will be no presented papers related to RBMKs although the general approach of the Russian GAN would be equally applicable to RBMKs and VVERs. Five papers related to the Severe Accident Management Joint Project will be presented:

- 1) "Overview of INSC Joint Project on Severe Accident Management" by Kraev (RINSC)
- 2) "SAM Strategies for the VVER-1000 NPP" by Fil (OKB-GP)
- 3) "Practical Possibilities to Implement the SAM Strategies in VVER-1000 NPPs" by Peressadko (AEP/Moscow)
- 4) "Adaptation of MELCOR 1.8.3 to the VVER-1000 NPP"
- 5) "Preliminary Analysis Results using MELCOR-320"

Bruce Spencer (ANL) and Alex Kraev (RINSC) met with Dr. A. Bukrinsky, who is head of the NPP Safety Division of GAN/SEC, to solicit his participation in SAM '99. At SAM '97 he presented a paper that laid the foundation for new requirements that have to be met to satisfy GAN accident mitigation and accident prevention requirements. He is the architect of the evolving Management of Beyond Design Accident (MBDA) approach in Russia. He agreed to participate in SAM '99 and he will consider submitting two papers (with colleagues):

- The GAN overall approach to accident mitigation and MBDA.
- Experience with MDBA accident analysis for Balakova NPP.

<u>Remote Execution of RELAP 3-D at RINSC</u> - During the past month, there has been extensive testing of remote access capabilities for remote execution of RELAP 3-D on the RINSC SGI Origin server. This testing was done to provide a demonstration of how RELAP 3-D might be accessed by users outside of RINSC, including users in Ukraine and Lithuania. So far, the software had only been tested locally on the SGI Origin itself. RELAP 3-D has a graphical user interface (GUI) that operates in the X-windows environment and allows any remote client with X-windows capabilities to access the software package. The client could be either a UNIX or DEC/VMS workstation, an X-terminal, or a simple PC with X-windows software installed. For the tests that were performed, RELAP 3-D GUI was executed on the SGI Origin in Moscow and a PC at ANL was used for remote access. Testing showed that the design of the GUI did not allow for efficient remote





Current Items: (cont'd)

operation. It was learned from INEEL that the GUI does not even perform well for clients on the same local network with the server. The problem is that there tight integration between the GUI and RELAP 3-D itself. The calculation sequences in RELAP 3-D are limited by the process of the updating of the client screen, resulting in very inefficient CPU utilization on the server (less than 2% CPU utilization). Therefore, execution of RELAP 3-D through it's GUI is not suitable for remote execution. After several methods were used unsuccessfully to run RELAP 3-D with the GUI, trials were done without the GUI. The GUI was switched off and the code was run in line mode. This approach worked very well and the server was now used to it's full potential since only single lines of progress information in 10-second intervals were written to standard output. In this mode, the user is not able to view intermediate information right away (or to control execution of the code by performing single time steps one at a time), but the user has full control over input and output files, all located on the server. For evaluation, pre- and postprocessing, and archival of results, input and output files have to be transferred, which can easily be compressed to improve transmission time by 80%. Also, standard UNIX commands and other more specialized routines can be used to cut only relevant information from the files and reduce their transmission time even further. The tests prove that remote execution of RELAP 3-D is feasible but can be done only if the GUI is not used. According to INEEL, it is not essential that the GUI be used to obtain valid results with to RELAP 3-D.

Development of Russian Language Version of SAPHIRE (Systems Analysis Programs for Hands-on Integrated Reliability Evaluations) - Idaho National Engineering and Environmental Laboratory (INEEL) has developed and is currently maintaining the SAPHIRE computer code, which is a software toolkit developed by INEEL for the U.S. Nuclear Regulatory Commission (NRC) for use in performing PRA. The NRC and DOE have provided English language versions of this software to Ukrainian and Russian organizations for performance of PRAs in those countries. A Russian language version of the software would allow the analysts and reviewers to work in their native language. A Work Order has been executed with RINSC to sponsor the translation of the SAPHIRE resource files (including interface, dialog boxes, and reports) and documentation (including online help and manuals) to produce a Russian version of SAPHIRE. RINSC will translate the necessary documentation and resource files to extend SAPHIRE to include a Russian/Cyrillic interface. Subsequently, INEEL will incorporate the translated material into the source code to produce an appropriate run-time version of SAPHIRE that has help documentation in the Russian language and produces output in the Russian language.







Activities Calendar:

June 1999

<u>Paper to be Presented on Joint Work on Coupled Codes</u> - A paper based on the assessment of the VNIIEF KORAT-3D parallel code performance on the ANL IBM SP computer will be presented at the American Nuclear Society Meeting in Boston in June 1999. The paper was jointly written by RINSC and USINSC participants The work contained in the paper was done during the INSC Technical Exchange Program in September 1998.

12-14 July 1999

<u>RELAP 3-D Training at RINSC</u> - INEEL (Jim Fisher and Walt Weaver) will provide training on the use of RELAP 3-D at RINSC to selected Russian analysts.

18-23 July 1999

Paper on Code Validation to be Presented at a National Meeting - A paper entitled RELAP5 Code Validation Methodology Applied to the RBMK and VVER Reactor Designs will be presented at the Second International Symposium on Validation of Systems Transients Analysis Codes, part of the Third ASME/JSME Joint Fluids Engineering Conference in San Francisco (July 18-23, 1999). The paper was prepared jointly by the U.S. organizations participating in the Joint Project on Code Validation and Verification (ANL, PNNL, INEEL) and the main Russian participants in the project (from EREC, Gidropress, RRC-KI, and NIKIET).

Week of July 26

<u>International RELAP Users Group (IRUG) Meeting</u> - Russian users of RELAP-3D will attend the next meeting of IRUG in Park City, Utah. A follow-up meeting is tentatively scheduled to occur in Obninsk, Russia in October as an adjunct to the INSP Analysis Forum.

July-August

<u>Semi-Annual Meeting of USINSC/RINSC</u> - The meeting will be timed to allow Russian visitors to attend IRUG (above).





Activities Calendar: (cont'd)

September 1999

Invited Paper on Coupled Codes to be Presented at International Meeting - An invited paper titled OECD/NEA PWR MSLB Benchmark Sensitivity Studies using SAS-DIF3DK will be presented at the International Conference on Mathematics and Computation to be held in Madrid in September 1999. The paper shows the high level of detail that is achievable with SAS-DIF3DK in the modeling of transients that exhibit pronounced spatial effects and coupled phenomena.

18-22 October 1999

SAM '99 Forum – The second Severe Accident Management (SAM) Forum, will be held at IPPE in Obninsk on 18-22 October 1999. The purpose of this meeting is to highlight the accomplishments of the SAM joint project, to disseminate the program information and program results to persons in Russia and the US involved in SAM-related activities, and to provide a forum for general regulator considerations, relevant R&D, and presentation of related programs worldwide. This includes presentation of preliminary SAM strategies for VVER reactors, status and early results using MELCOR-V320, update on the status of SAM in US and MBDA in Russia, related programs such as TACIS/Balakovo and MELCOR Certification, and results of severe accident experiments and analysis in Russia and the US having applicability to SAM. There will be twenty four one-hour papers, sixteen from Russia and eight from the US. This meeting will be jointly sponsored by the US and RF INSCs. Bruce Spencer (ANL), Nikolai Fil (OKB-GP) and Lev Kochetkov (IPPE) will be the technical co-chairmen and Dr. Zrodnikov, director of IPPE, will be the general chairman.